



Biological Psychology Handwritten Notes

Introduction to Psychology (National University of Singapore)

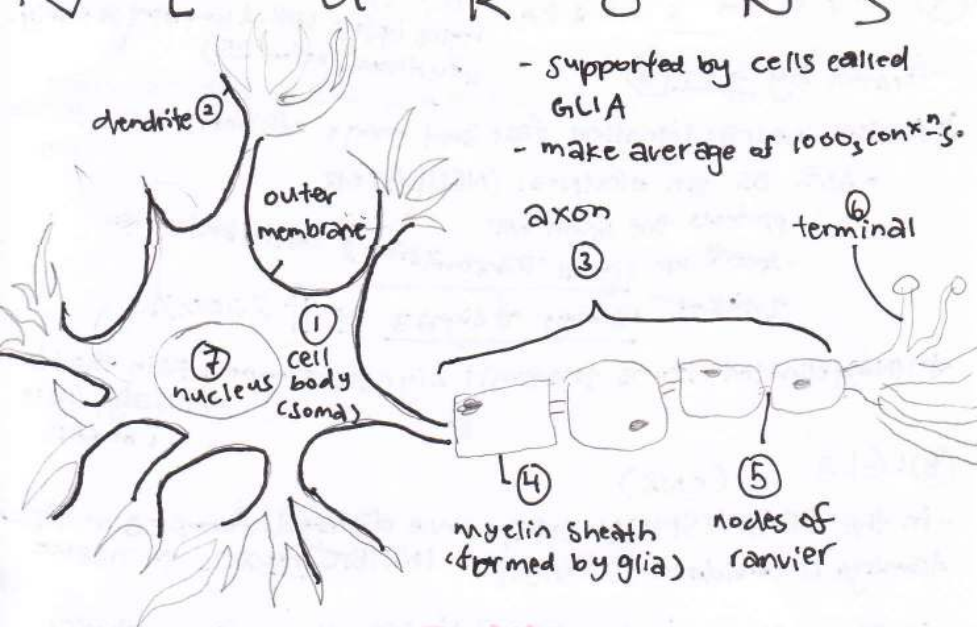


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N E U R O N S



- supported by cells called GLIA
- make average of 1000,000 connections

① SOMA/CELL BODY

FUNCTION

- contains (7) nucleus $\Rightarrow$ [TRANSLATION of GENETIC CODES into MANUFACTURE OF PROTEINS]

STRUCTURE: (—)

- Features an OUTER MEMBRANE $\Rightarrow$ BARRIER b/w EXTRA & INTRA cellular fluid

- $\rightarrow$ consists of fatty, non hydro-soluble materials
- $\rightarrow$ holds apart water based fluids

- $\rightarrow$ PORES: acts as channels that allow chemicals to move



- Extensions from cell body: (2), (3)!

MANY

② DENDRITES (facilitates INFO-processing & comms)

- receives input from other neurons! (multiple)

③ AXON

STRUCTURE:

- responsible for carrying info to other neurons
- Has myelin sheaths to facilitate com
- Appears WHITE $\rightarrow$ areas w/ high axon count
- Synaptic vesicles (chemical messengers) + terminal

- ④ myelin sheath (myelin growth in nervous system begins before birth & completes @ early adulthood, before 25)
- formed by glia (B)
 - * makes neural signaling fast and energy efficient (less efficient neurons)
 - acts as an electrical INSULATOR
 - protects the axon cell
 - speeds up signal transmission & contributes to quicker recovery of signals $\Rightarrow \uparrow 3000x!$

- Unmyelinated axons transmit signals slower: pain that's dull, aches, lasts longer

⑧: Glia (CNS)

- in the BRAIN/SPINAL CORD: once damaged, forms scar tissue damage is considered PERMANENT & INHIBITS repair to tissue
- in PNS, damage is FIXABLE $\Rightarrow$ No scar tissue formed + glia help DAMAGED AXONS REGROW

NEURON SIGNALING

- ① Axon: ACTION POTENTIAL: Travels length of axon from cell body to terminal
- ② Action potential arrives b/w 2 neurons $\Rightarrow$ Axon terminal. Signals release of chemical messengers

Next Stage

① ELECTRICAL $\rightarrow$ CHEMICAL

- At rest, resting potential ($> -$)

interior axon external fluid

Threshold for action potential reached when depolarised enough!

after sequence of events ($\uparrow$)

- open channel, neuron $\rightarrow$ $\uparrow$ Na^+ rush in

Refractory period:

K^+ channels open & $\text{K}^+ \rightarrow$ outside

$\rightarrow$ cell becomes $\downarrow$ ($< -$), $\rightarrow$ $< -$ X AP

② Propagation - axon:

- axon myelin: signal jumps from one node to another $\rightarrow$ chain reaction, pushing the (+) $\Rightarrow$ NODES OF RANVIER (AP) $\rightarrow$ terminal

Synapse

vesicles receptors

AP $\rightarrow$ synaptic cleft

neurotransmitters receptors

- any remaining NT broken down by enzymes for reuptake:

- NT move back into releasing neuron through TRANSPORTERS to be repackaged for later use.
- ① EXCITATION (slight DEPOLARISE)
- ② INHIBITION (HYPERPOLAR)

- Hypothalamus:
- 1) Hunger
 - 2) Thirst
 - 3) Body Temp.
 - 4) Bio rhythms & sex
- Associated Responsible for V.F's.

HOMEO STASIS

ALSO processes social & emotional reward-related info

Hippocampus: win fold @ June 2 of F & T lobe

Amygdala: - Embedded in TEMPORAL LOBE

- EMOTIONAL damages receives sensory info, producing emotional output

- Fight
 - Flight
 - Feeding
 - F*cking / fornicating
- part of peripheral nervous system
- ★ Directs autonomic nervous system &

when fear detected: starts emotional cascade

pituitary & adrenal gland release neurotransmitter

- ① Identifies, ② Remembers, ③ Responds to fear & aggression
- Participates in active exploration in our social environment & evaluation for fear

- Gateway to cortex because input most sensory systems travel to thalamus ①, then info forwarded to CC (kind of like router)

in brain → stimulus judges things worth in response to emotion

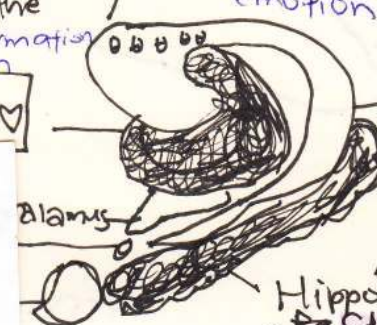
THALAMUS & **basal ganglia**

voluntary movements

Degeneration in Parkinson's → initial of voluntary movement difficulty.

- sorts data
 - connects btw T & CC
 - Also coordinates activity of cortical neurons - difficult
- Handles the sensory information interpretation

Thalamus



Basal Ganglia: associated w/ (□) ADHD & OCD

NUCLEUS ACCUMBENS

- pt. of the brain's reward & pleasure circuitry
- CELL BODIES located in midbrain forming connection structures in this

ANTERIOR CINGULATE CORTEX

★ Function: **SOCIAL INTERACTION**

strong social connection: active NA when viewing happy scene

weak connection in N

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- Forward 2/3 of w/ Hypothalamus
- ACC also important in decision making, emotion, anticipation of reward & EMPATHY

PCC: memory & visual processing!

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CAL STRUCTURES no change to int, personality b/c H.C damage.

MIDBRAIN

- sensory & reflexes, more pain
- contains the periaqueductal pons

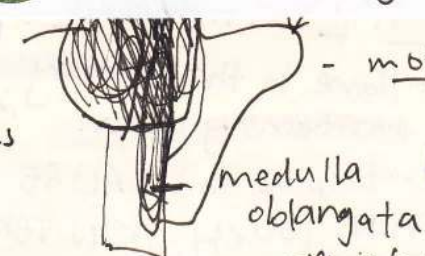
emotion: arousal (fast firing for waking) / slow firing (for unconscious)

4 actions

ellum - motor movement & balance, posture, stance

motor/muscle memory

- bridge b/w medulla & rest of the brain + connects cortex to cerebellum
- sleep, arousal & facial expressions.
- REM sleep



- * INVOLUNTARY actions
- carries info travelling from the spinal cord to the rest of the brain
- Heartbeat, breathing & blood pressure + swallowing
- crucial part of the brain

1 + 2 + 3 + 5

THE FOREBRAIN (Higher order processing)

CEREBRAL CORTEX: GRAY MATTER (thin)

- Frontal lobe
- Home of the primary motor cortex
- Initiation of voluntary muscles



Hom Prefrontal cortex:

- Concentration
- Planning
- Judgment
- Emotional expression
- Creativity
- Inhibition

Abnormalities w/ may account for some psych disorders eg Schiz & ADHD

4 + 7 + 8

TEMPORAL LOBE

- specialised for particular functions

olfactory Area!



ORBITO frontal cortex:

- Retains intelligence, lang skills & ability to pay attention, learn & remember even aft

★ Plays an important to their emotional lives

- Damage causes dramatic deficits in behaviour & experience

NEUROTRANSMITTERS:

- 1) ACh (Acetylcholine) ⇒ neuromuscular junctions (commands muscles)
★ Key NT in ANS: carries commands from CNS to organs
★ Related to learning & memory! Alzheimer's disease first to detect
- 2) Norepinephrine: ★ AROUSAL & VIGILANCE (sympathetic nervous system)
- Fight / Flight
- 3) Dopamine: ★ Mvmt, Planning, reward. → reward & pleasure
↳ rewards acts promoting survival & reproduction
★ Parkinson's
- 4) Serotonin: ★ Mood, aggression, sleep
- 5) Endorphins: ★ Pain management

RIGHT & LEFT BRAIN

- corpus callosum connects right & left brain.
- LATERALISATION: special type of localisation of function in the cerebral cortex.

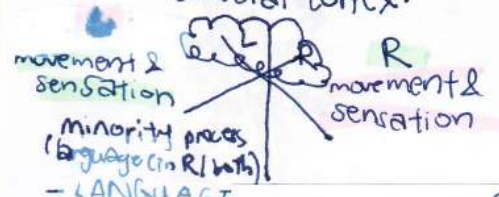
LATERALISED processes like

- (+) L: mathematical computation & logical reasoning
- (-) R: some music functions, spatial information, intuition & visual arts

MIGHT provide individuals w/ ability to MULTITASK

12 pairs of CRANIAL NERVES
↓
neck, head, some internal organs

AUTONOMIC NERVOUS SYSTEM
- control of tissues eg GLANDS & ORGANS
- ensures heart keeps beating & lungs continue to inhale & exhale w/o conscious DIRECT



ENDOCRINE SYSTEM

- made up of glands releasing HORMONES
- responds to INPUT from nervous system (SPECIFICALLY from HT)
- ★ Arousal, metabolism, growth & sex

PINEAL	PITUITARY	THYROID	ADRENAL
- melatonin	regulated by HT	- A/↓	- pituitary hormones
- importance in maintenance of sleep-wake cycles	- oxytocin & vasopressin	- rate of metabolism	- adrenal glands activated - release other
	- breastfeeding	- ↓ levels	
	- fluid levels	- can mimic	
	- dust, emotion		
	- stress response		

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LOCALISE cause eg SKIN temp. difficulty slotting card into primary (card reader)

- 5 senses:
- 4) gustation
- 5) somatosensation

EXCITATORY

INHIBITORY

sympathetic para enteric

- preps for actions - comm w/ us to endocrine system

situations requiring energy

STORE NUTRIENTS to repair body

- "fight & flight" response

↑ direct resources in body

↑ return activities of internal organs to baseline level

↑ 95% of serotonin!

AROUSAL

by responding to INFO & AB (borders, shading) → perceives

CONNECTION

① TEMPORAL - recognises objects

② PARIETAL

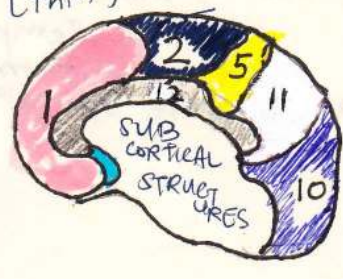
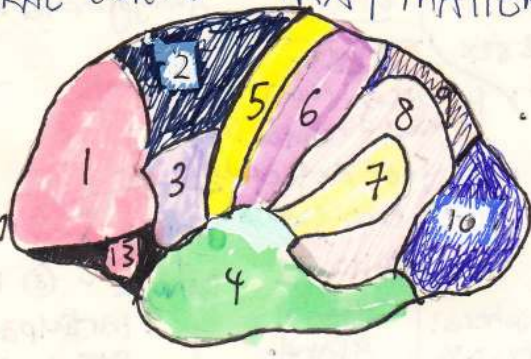
- Process mvmt of objects!

1 + 2 + 3 + 5

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- no issues in touch & position, BUT no control over affected limbs

ORBITO frontal cortex: ("alien hand")

- Retains intelligence, lang skills & ability to pay attention, learn & remember even after damage

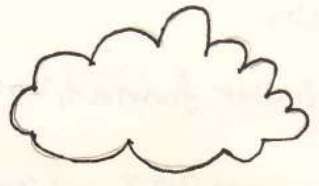
★ Plays an important to their emotional lives

- Damage causes dramatic deficits in social behaviour & experience of emotion (no delayed gratification)

Abnormalities in OFC may be linked to antisocial behaviour

Broca's Area

- muscles of speech?
- controls ability to TALK/muscles



OCCIPITAL LOBE (10)

- Interprets info from eyes by responding to BASIC INFO ABOUT AN IMAGE (borders, shading, colour, mvmt)
- Not enough to read (recognise) → perceives

CONNECTION w/

- Temporal: - recognises objects we see

PARIETAL

- Process mvmt of objects!

4 + 7 + 8

TEMPORAL LOBE

- specialised for particular functions

★ processes HIGHER VISUAL SYSTEM TASKS

including recognition of objects & faces of familiar people

- Important parts of the TL:

o PRIMARY AUDITORY CORTEX:

- Allows us to process INCOMING SOUNDS
- Wernicke's Area:
 - receives info from auditory cortex, & functions to assign word meanings
 - Patients w/ Wernicke's Aphasia have altered comprehension of their speech.

+ 10: PARIETAL LOBE

- Home to the primary somatosensory cortex
- Help us to LOCALISE cause eg PAIN, TOUCH, SKIN TEMP. difficulty & BODY POSITION
- Also home to primary sensory cortex:
 - process & make sense of info gathered by 5 senses:
 - vision
 - gustation
 - smell
 - touch
 - hearing

5

offactory Area!

11

- sensory Association

PERIPHERAL NERVOUS SYSTEM

SOMATIC NERVOUS SYSTEM

- peripheral portions of sensory & voluntary mvmt sensation
- CNS (sensory info) → muscles
- 31 pairs of SPINAL NERVES
- torso, limbs

o 12 pairs of CRANIAL NERVES

- neck, head, some internal organs

AUTONOMIC NERVOUS SYSTEM

- control of tissues eg GLANDS & ORGANS
- ensures heart keeps beating & lungs continue to inhale & exhale w/o CONSCIOUS DIRECT

EXCITATORY / INHIBITORY

- sympathetic para enteric
- preps for - allows - comm w/ situations us to endocrine system requiring STORE NUTRIENTS to ensure energy repair body release

- "fight & return & flight" activities of internal organs to baseline level
- 95% of serotonin!

AROUSAL

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